

NECK AND BRAIN VASCULAR IMPAIRMENT IN A GROUP OF PATIENTS WITH METABOLIC SYNDROME

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ABSTRACT

Background. Metabolic syndrome (MetS) is an entity with proved involvement in cardiovascular pathology. We aim to highlight the existing type of cerebrovascular damage in a group of patients with MetS by comparison to the control group.

Method. We analyzed 36 patients with MetS (defined according to NCEP:ATP III 2001 criteria) and a number of 25 subjects that represented the control group, aged between 40 and 67 years old, that had no personal history of cardiovascular or cerebrovascular disease. The subjects were clinically-neurologically and metabolically evaluated, as well as biochemical and haematologically explored. Neck and brain vascular impairment (IMT and atheromatous plaques measurement, cerebral vasoreactivity) was highlighted using cervical and transcranial neurosonology (including performing the apnea test). The obtained results were statistically processed.

Results. Patients with MetS had higher average IMT than control (0.62 mm to 0.54 mm) as well as a higher percentage of atheromatous plaques 25% (9/36) when compared to the control group 20% (5/25). Cerebral vasoreactivity impairment was equal 52.8% (19/36) in MetS patients and 52% (13/25) in control group subjects. None of these differences was statistically significant. In patients with MetS the average IMT was correlated with the existence of atheromatous plaques ($p = 0.023$) and other associated risk factors like arterial hypertension&smoking ($p = 0.018$), dyslipidemia&obesity ($p = 0.003$), smoking&increased abdominal circumference ($p = 0.049$). For the control group the existence of atheromatous plaques was correlated with smoking status ($p = 0.027$).

Conclusions. Even though the neck and brain vessels impairment was better expressed in the MetS patients group, there is no a statistically significant correlation. In MetS patients presence of different combinations of vascular risk factors determines strong associations with increased IMT.

Key words: neck and brain vascular impairment, metabolic syndrome, risk factors

INTRODUCTION

Acquired risk factors for cerebrovascular disease are: arterial hypertension, diabetes, dyslipidemia, sedentariness, smoking, alcohol intake, ischemic heart disease, atrial fibrillation, atherosclerotic disease of the carotid artery, personal history of TIA or stroke. (1,2) MetS is a clinical entity defined and used in medical practice over two decades ago. Diagnosis criteria were modified in time, according to the different organizations involved in definition of this clinical concept (WHO 1998, NCEP:ATP III 2001, IDF 2005), but all have some

common elements like central adiposity and increased insulin resistance. (3,4) When analyzing the diagnosis criteria for MetS we can easily observe that these overlap the list of risk factors for vascular disease. (4)

Our study's purpose is to assess the degree of vascular damage in neck and brain arteries due to MetS when cerebrovascular disease is not clinically manifested. A second goal was to identify those markers of neck and brain vascular impairment in patients with MetS when compared to subjects without metabolic disease from the control group. (6,7,8)

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METHOD

There were analyzed the characteristics of a group of patients who were addressed to Neurology and Endocrinology, Diabetes and Metabolic Disorders Clinics from Elias Emergency Hospital between August 2009 and December 2011. These patients were aged between 40 and 67 years old and did not have a personal history of cerebrovascular disease or a neurological symptomatology associated with central nervous system impairment.

Patients were neurologically and metabolically evaluated (body mass index measurement considered pathological when higher than 30). Laboratory findings consisted in running blood tests, including glycemic and lipid profiles and neurosonological analysis with IMT-CCA, atheromatous plaques assessment, TCD and cerebral vasoreactivity measurements. MetS diagnosis was established using NCEP:ATP III 2001 criteria (Table 1). (9) Ultrasonographic evaluation was done in the Neurosonology Laboratory from the Neurology Clinic in the Elias Emergency Hospital. IMT and atheromatous plaques measurements were done according to Manheim Consensus. (10) Cerebral vasoreactivity was evaluated using TCD monitoring apnea test. (11,12)

TABLE 1. SM diagnosis criteria

	NCEP:ATP III 2001 (minimum 3 of 5)
Central/abdominal obesity	Waist circumference > 102 cm in men and > 88 cm in women
Seric triglycerides	≥ 150 mg/dl
HDL-cholesterol	< 40 mg/dl in men or < 50 mg/dl in women
Arterial hypertension	≥ 130/ 85 mmHg or specific therapy
À jeun glycemia	≥ 100 mg/dl or diabetes mellitus

Statistical analysis of the studied groups was performed using *t* and ANOVA tests (Analysis Of Variance). From the *t* tests category, the ones used were tests for independent patterns and when existed two or more independent variables it was used factorial ANOVA in order to highlight categorical variables association with a variable defined as a period or report.

There were also used correlations and regression, statistical analysis related procedures. Given the existence of categorical variables in the statistical analysis performed, we used chi-square test of association. Statistical analysis program used by us was SPSS 17.0. (13,14)

RESULTS

We analyzed 61 patients, the study group consists of 36 patients with MS and 25 patients in the control group.

Gender distribution was about the same, percentage women/men = 56%/44%.

The average age of MetS patients was higher, 52.53 years compared to 48.88 years in controls.

Pathology that defines metabolic damage is significantly better represented in the group of patients with MetS. (Table 2)

TABLE 2. Clinical and laboratory features

	Patients with MS (n = 36)	Control (n = 25)	p value
Female	20 (55.6%)	14 (56%)	0.953
Average age (years old)	52.53	48.88	0.712
Smoking status	15 (41.7%)	14 (56%)	0.270
Arterial hypertension	30 (83.3%)	4 (16%)	< 0.001
Dyslipidemia	29 (80.6%)	14 (56%)	0.039
Obesity	26 (72.2%)	12 (48%)	0.055
Increased abdominal circumference	30 (83.3%)	15 (60%)	0.042

MetS patients had higher IMT than control group, an average of 0.62 mm to 0.54 mm ($p = 0.088$), without any significant pathological value. Elevated IMT with pathological significance (> 0.9 mm) were present in 13.9% (5/36) of patients with MetS versus 4% (1/25) patients in the control group ($p = 0.202$). Atheromatous plaques were present in a higher percentage of MetS patients 25% (9/36) versus 20% (5/25) in the control group ($p = 0.648$). Affected brain vasoreactivity was present in equal percentage between the two groups 52.8% (19/36) in patients with MetS and 52% (13/25) in controls ($p = 0.952$). None of these markers of neck and brain vascular damage was statistically significant correlated with the presence of Mets. (Table 3)

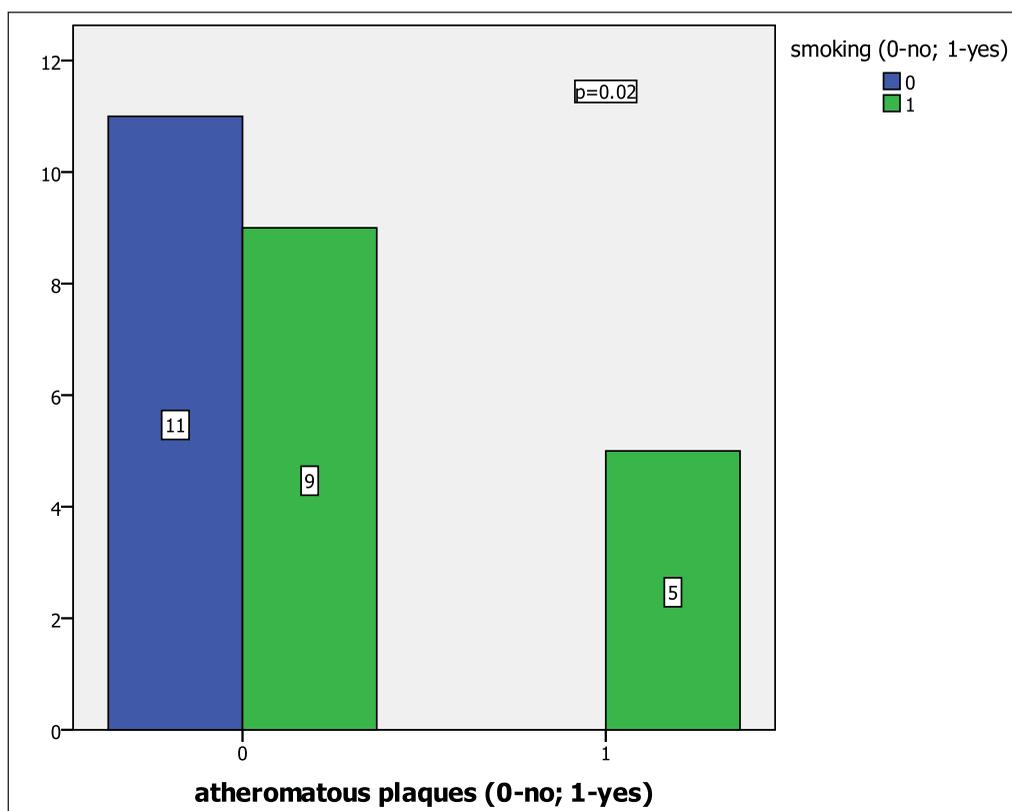
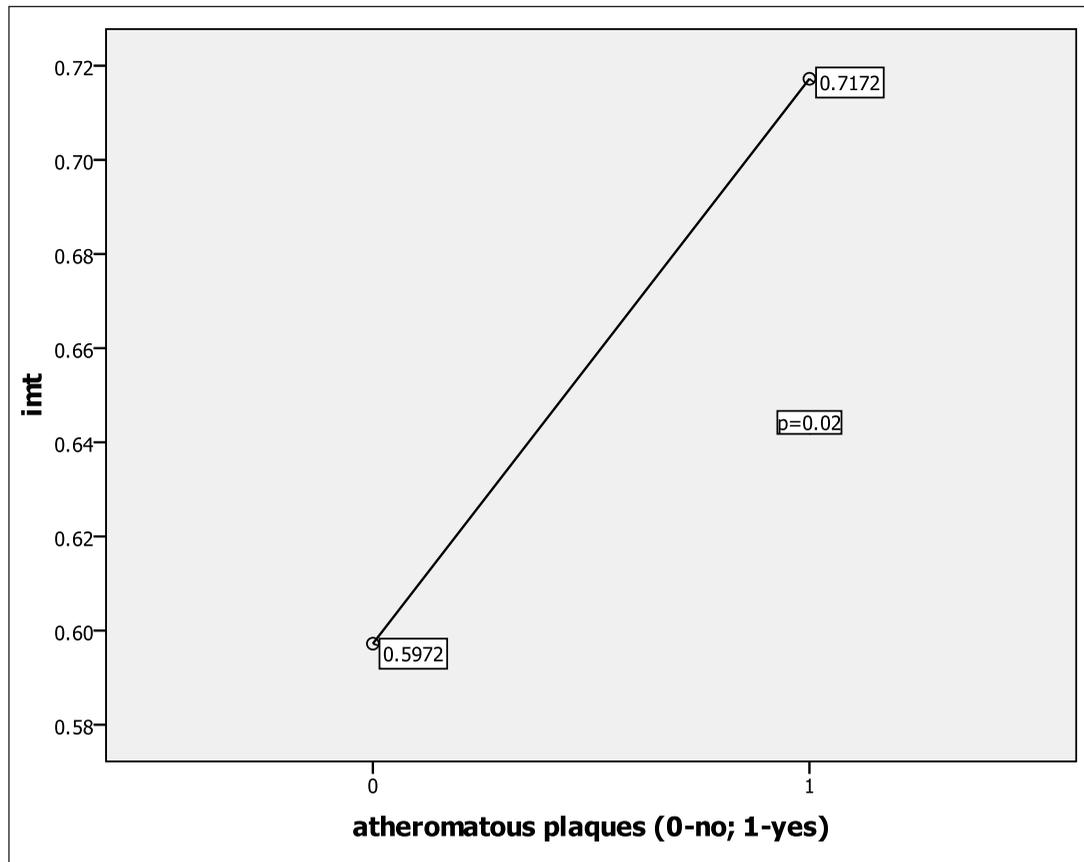
TABLE 3. Neck and brain vascular impairment markers

	Patients with MS (n = 36)	Control (n = 25)	p value
Cervical atheromatous plaques	9 (25%)	5 (20%)	0.648
IMT > 0.9 mm	5 (13.9%)	(4%)	0.202
Average IMT (mm)	0,62	0.54	0.088
Cerebral vasoreactivity impairment	19 (52.8%)	13 (52%)	0.952

We analyzed the relationship between the presence of certain risk factors in our patients and the changes that occurred in their neck and brain circulation.

In the group of patients with MS average IMT was correlated with the presence of atheromatous plaques

($p = 0.023$) and associations: arterial hypertension & smoker status ($p = 0.018$), dyslipidemia & obesity ($p = 0.003$), smoking & increased abdominal circumference ($p = 0.049$).



In the control group, the correlation between the presence of atheromatous plaques and smoking status have statistical significance ($p = 0.027$).

DISCUSSION

Our study revealed no significant differences between the two analyzed groups on cerebrovascular damage. An elevated tendency exists in the group with MetS, but it is necessary to analyze a larger group of patients.(6)

The presence of increased IMT and plaques is probably the most obvious expression of neck and brain vascular damage in patients without manifest cerebrovascular symptoms. (6) Vasoreactivity is usually an unexplored marker of cerebral circulation and could be the first outlined pathological change in the presence of specific risk factors. (7,15) Our study failed to demonstrate a statistically significant correlation of this aspect with evaluated pathology.

Composition of study groups is difficult. If demographic parameters (sex, age) are relatively easy to balance, it is more difficult to identify a group of individuals without any risk factors (for example

smoking) or without an associated pathology (hypertension, dyslipidemia, obesity, etc.) given their increased frequency in general population. An ideal sample of healthy individuals is unrealistic for the same reasons.

Evaluation of the brain vasoreactivity requires the presence of properly equipped neurosonological laboratories and qualified personnel in this regard.

CONCLUSIONS

1. Markers of neck and brain vascular damage are better represented in MetS patients, but this aspect does not have statistical significance.
2. Although only a small proportion of patients (up to 25%) had cervical vascular injury markers present, half of the patients examined had impaired cerebral vasoreactivity.
3. The combination of certain risk factors in patients with MetS is significantly associated with neck and brain arteries impairment.
4. Smoking is a significant risk factor for cerebrovascular damage.

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